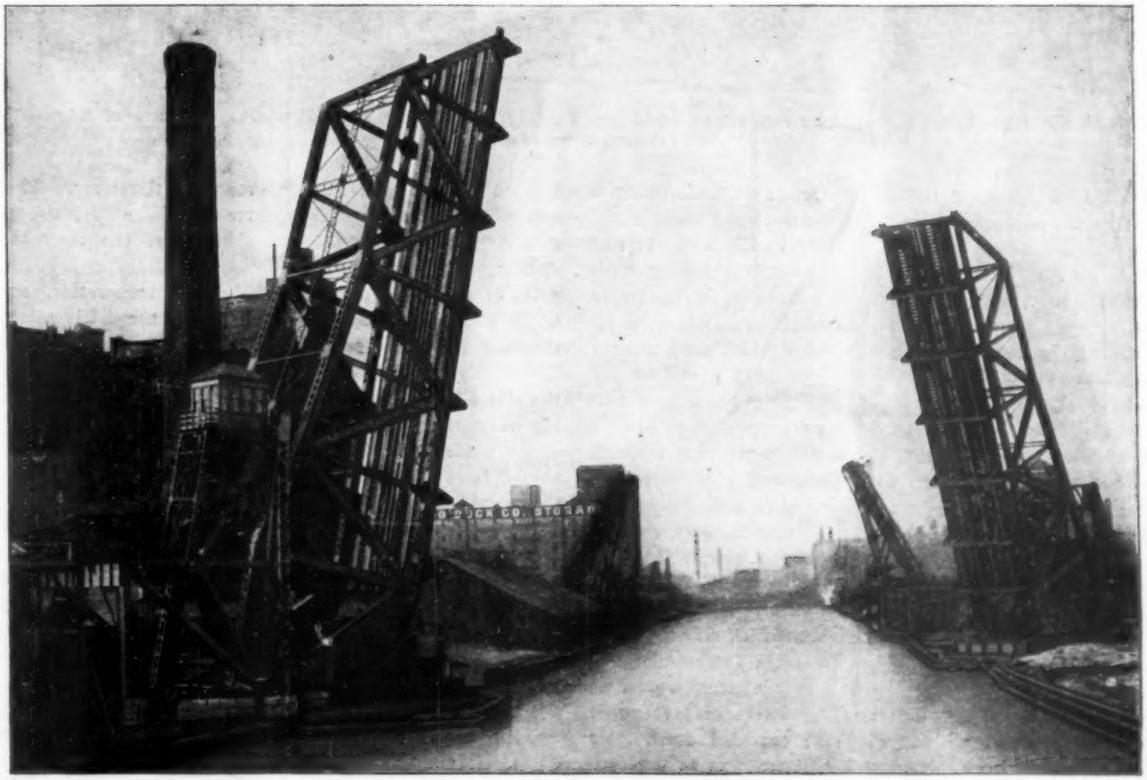
# POPULAR MECHANICS

An Illustrated Weekly Review of the Mechanical Press of the World

"Tells you how to do things." "Written so you can understand it."

Vol. 2. No. 7. CHICAGO, AUGUST 16, 1902. PRICE 5 CENTS.


## Most Modern and Most Perfect Type of Bridge



**Scherzer Rolling Lift Bridge at Entrance to Grand Central Station, Chicago--Longest and Safest Movable Bridge in the World**

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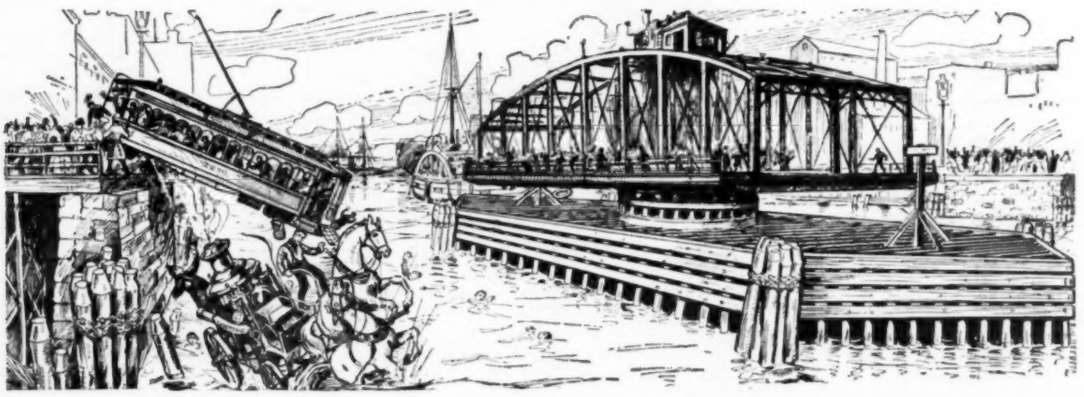
# Movable Bridges of Times Past and Present

## Inconvenience, Annoyance and Perils of Old System Dispelled by a Later Day Ideal Method of Spanning Streams



This illustration is typical of the center-pier swing type of bridge, showing the obsolete and destructive character of this method of crossing a waterway.

The method of spanning navigable streams is undergoing a revolution as a result of an invention born of the complicated conditions existing along the Chicago river in Chicago. It was at a time when the United States government was putting forth its best efforts to remove all obstructions from navigable rivers that the Chicago river was being almost blockaded in some parts by the building of center pier bridges, structures that were pivoted on a foundation with a large bridge protection pier that lay right midway the channel, dividing it at that point into two separate passageways. This river, a very busy stream, always crowded with vessels large and small, winds its way through the very heart of the western metropolis and constitutes the foundation and principal support of Chicago's commercial supremacy. It is the foremost harbor in point of tonnage, as well as in the number of arrivals and clearances of vessels,in America. A bridge high enough to permit vessels to pass under it would have made traffic across the river practically impossible and would have been extremely expensive in construction.

Center pier bridges daily became more troublesome and traffic across them more congested. Several very expensive tunnels had been constructed under the river for street cars to avoid the delays, danger and hindrance of the crowded center pier swing spans. Aside from the menacing obstruction of the center piers, which often caused boats to become jammed between each other in the harbor, the bridges were cumbersome of operation. Several serious accidents made the conditions more intolerable. Locomotives, cars, vehicles and men have been plunged into the river while the bridges were open. It took long to swing them, and during the process horses, cars, wagons and pedestrians were packed in a jam at either entrance, waiting for the bridges to again be thrown crosswise the river. Then there was a surging mass of commerce and humanity, sweeping pell mell across, that made men shudder at the thought of the structure's giving way.

Often the machinery would become inoperative, sometimes while the bridge lay open lengthwise the harbor, sometimes when closed, and sometimes when half closed and half open. Frequently it was so as to block harbor traffic and frequently the street had to be closed until the bridge could be fixed. People were often caught on the bridge, when it would get out of order while open, and no matter how great their hurry they would have to wait until the machinery was repaired before they could get to shore.

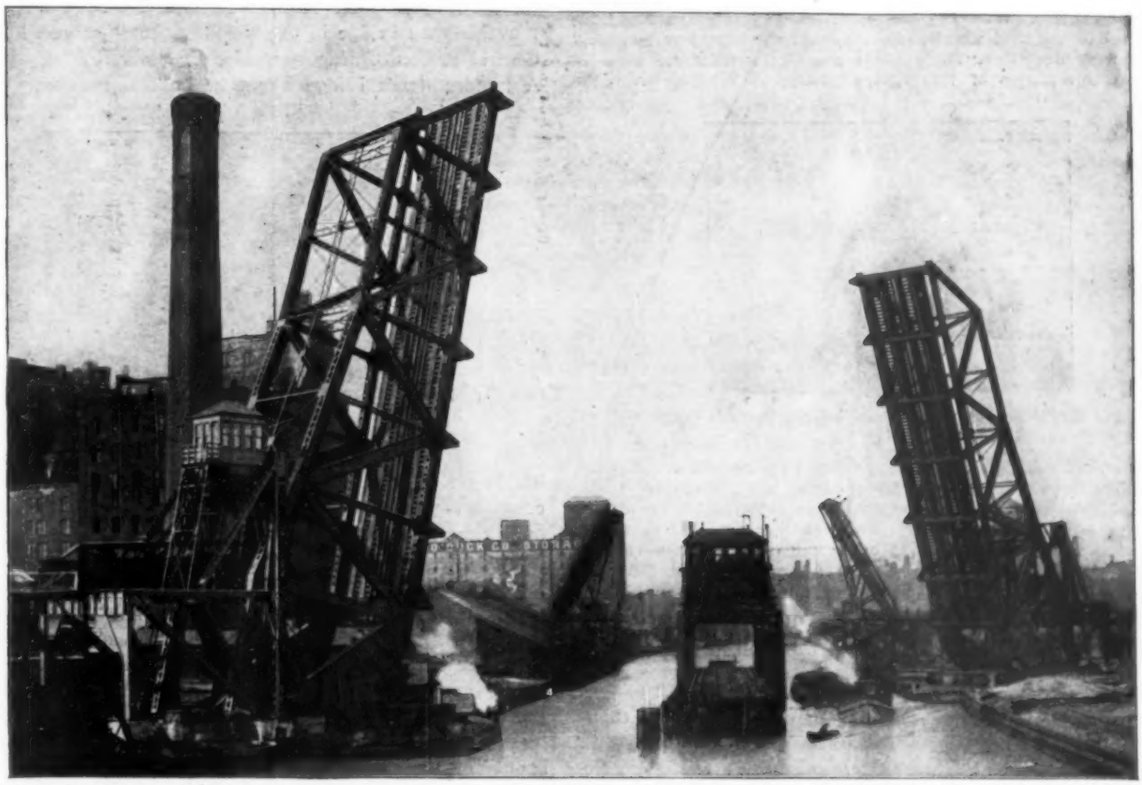
These menacing conditions caused a loss of thousands of dollars each day to the city's commerce. The foremost engineers of Europe and America were called on to solve the perplexing problem. Styles of bridges as varied and quaint as they were numerous were proposed, and some were constructed. One—the Halsted St. lift bridge—was built at a cost of $237,000, and has become famed as a national curiosity. It was the only one of the kind ever built. This was a bridge made to raise straight up, like a colossal elevator, between four massive corner structures. It would raise so high that the tallest mast could pass below. There are those in Chicago now who can tell of hours and a night they have spent poised between heaven and earth, on this curious construction; for this bridge, too, developed the faculty of getting out of order, often at the most critical moment. When it would get fastened at the top of the pillars there was no way for the men thereon to get to earth again until they were lowered on the bridge. Food for the people was furnished by means of pails and baskets raised and lowered by long ropes.

Scherzer Four-Track Railroad Bridge, Chicago—Closed.

A bridge, composed of two movable leaves that came together in the center of the stream and rolled up and down from a pier located on either shore, was built. It was called the Scherzer Rolling Lift or Bascule bridge. This solved the problem. At once all the many difficulties were overcome. The new bridge removed the obstacles of center piers, danger to the public, hindrance to harbor and street traffic; loss of time in operation and cumbersomeness in movement. It was an improvement on the pivot or trunnion type of bascule bridge which type has many disadvantages and is extremely expensive in con-

:struction and operation as shown by the Tower bridge at London, England, and the smaller trunnion bridge recently built at Clybourn Place, Chicago.

The Scherzer Rolling Lift bridge, the new and modern type of bascule bridge which may be regarded as one of the most re-



**Scherzer Bridge, 275-ft Span, in Open Position, also Swing Bridge, in Open Position, Obstructing Channel**

(View of Improved Channel, after Removing this Swing Bridge Obstruction, is Shown on Title Page)

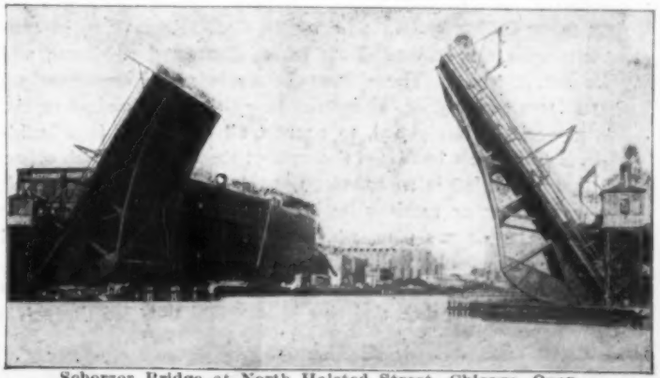
markable mechanical achievements of the day, was the invention of William Scherzer, a noted civil engineer. He died shortly after completing the plans for the Metropolitan elevated railroad bridge and the adjacent highway bridge at Van Buren St., Chicago, the two first bridges of this type. The business founded by him was continued under the direction of his brother, Albert H. Scherzer, who became president and chief engineer of the Scherzer Rolling Lift Bridge Co. The bridge is constantly being improved and its use widely extended to meet the most complicated and difficult conditions. Scherzer Rolling Lift bridges are now being built at many points along the Chicago river, also in New York, Boston, Cleveland, Buffalo and many other places at home and abroad for railroad, street railroad and highway traffic.

Wherever there is vessel traffic the modern Scherzer Rolling Lift bridge is supplanting the old styles of movable bridges. Graceful and artistic in appearance, simple in construction, strong as structure of steel can be made, easily and rapidly manipulated, this is regarded by engineers and mechanical writers everywhere as the ideal movable bridge, the bridge of the 20th century, the offspring of modern conditions and requirements. It is the most important departure in the methods of bridge building that has been made since the beginning of the world. In the leading cities of America it is fast replacing the old style bridges and now it has made its way into Europe where it seems to be exciting even more attention than it has here. With one voice the scientific press proclaims this bridge without an equal. Here is what some of the publications say:

**The Scientific American: "The rolling lift bridges which have been constructed during the past few years in Chicago and at other points in the United States constitute so distinct an advance over the types of movable structures heretofore utilized in spanning navigable waterways as to have aroused deep interest abroad; and the favorable verdict upon their claims for superiority indicated by the arrangements for installation of similar bridges abroad is particularly significant in view of the fact that the most distinguished European engineers have for more than half a century wrestled with the problem of accommodating the highway traffic over congested waterways, such as the Thames."**

**The Inland Architect and News Record: "The movable parts of the Scherzer rolling lift bridge are supported by piers placed on the sides of the navigable channel and no center pier support is necessary. The entire navigable channel is available and is unobstructed for the passage of vessels. The span of the bridge may be large enough to fill any requirements of navigation without impairing the simplicity, safety, or efficiency of the bridge. It moves when opened in the most advantageous direction; that is the vertical direction entirely within the lines of the roadway; it does not encroach upon or interfere with adjacent bridges, adjacent docks or adjacent waterway, nor would it interfere with any future additions to the width of the bridge. When opened for the passage of vessels, it acts as a barrier, closing the roadway, and thus absolutely preventing the many disastrous accidents common to swing bridges."**

**The Railway Age: "One of the most conspicuous and promising developments growing out of these difficulties has been the rolling lift bridge. Bridges of this type built after the plans of the Scherzer Rolling Lift Bridge Co., of Chicago, have been very successful, and have been frequently described in the columns of the Railway**



Scherzer Bridge at North Halsted Street, Chicago, Open.

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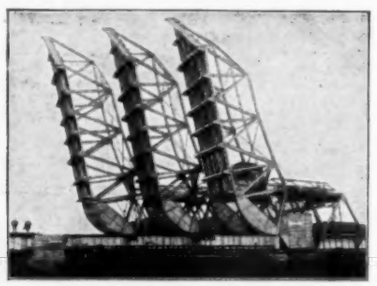
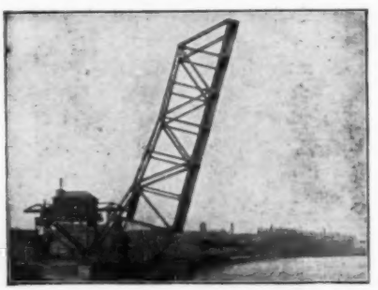
Age. (Sept. 22, 1899; May 25, 1900; June 8, 1900; March 15, 1901; July 16, 1901; Sept. 13, 1901.) The more these bridges are used and the more they are studied, the more their adaptability and economy become apparent."

The Successful American: "The Scherzer rolling lift bridge fulfills every requirement essential to a movable bridge. Its introduction marked a new era in the progress of bridge design and construction. It eliminates the objectionable features of the pivot or trunnion bascule bridge, the swing bridge, the direct lift bridge, and is more economical than the high-level bridge. It spans navigable waterways in the most simple, efficient and least expensive manner."

The Marine Review: "These views graphically illustrate some of the many advantages of this type of rolling lift bridge over the center pier swing bridge which is now being rapidly discarded. The bridge gives one adequate center channel for the passage of vessels instead of two inadequate side channels as supplied by the center pier swing bridge. The new bridge does not encroach upon water, land or dock space, as in opening or closing it moves in a vertical direction within the roadway. These illustrations show that the fundamental principle of the center pier swing bridge is radically wrong and that every increase in the length of span or width of a swing bridge multiplies its objectionable features and makes it more obstructive to navigation, whereas the fundamental principle of the rolling lift bridge is right and each increase in length of span or width of bridge, instead of impairing, multiplies its advantages."



Six-Track Scherzer Railroad Bridge, Boston—Open.



Scherzer Railroad Bridge, Cleveland—Open.

Our space will not permit the quoting of more of the thousands of favorable comments passed on this new bridge in America and Europe. It is attracting increased attention in the daily as well as in the scientific press, and engineers are being sent from foreign lands each week to inspect its mechanism.

The wonderful eight-track bridge across the Sanitary and Ship canal at Campbell Ave., Chicago, the largest and safest movable railroad bridge in the world, is a Scherzer Rolling Lift bridge. The scarcely less remarkable six-track railroad bridge at the South Terminal station, Boston, Mass., and the longest movable span bridge in the world at the entrance of the Grand Central station, Chicago, are also Scherzer Rolling Lift bridges. A hundred-track bridge might be built if necessary by simply building single or double track bridges side by side. They are coupled together so that the entire structure may be operated as one bridge; or they may be each operated separately. The motive power is usually electricity, but all other forms of power have been used successfully, and one man is all that is required to operate a bridge having a number of tracks. With this type of bridge it is possible to economically span any desired width of navigable channel without a center pier obstruction.

The invention of William Scherzer enables the economical removal of artificial obstructions from rivers and harbors and makes feasible ship canal construction even in the most densely populated countries.

Splendid and Artistic Effects in a long bridge, requiring a movable span, made possible only by the Scherzer Rolling Lift Bridge.

## WIRELESS TELEGRAPHY FOR EVERYBODY.

### Londoners May Buy Complete Telephone Outfit for $20 and Have to Pay But $5 a Year Royalty.

With water and gas pipes as conductors London is to have a system of wireless telegraphy and telephony that may be enjoyed by every resident of modest means. A company with a nominal capital of $875,000 has already been formed and the Armstrong-Orling system will be installed. Everything in connection with the scheme down to an illustrated catalogue and price list is ready. The system differs in many important respects from that of Sig. Marconi. It will be the simplest matter in the world, it is claimed, to connect all the rooms in a building and to connect buildings throughout the city with each other. All that is needed is to connect the telephones in a room with the transmitter or receiver by means of a short wire with the nearest water or gas pipe, which will carry the current to and from the earth. The walls of houses do not form any obstacle. In tests of the system the electric current was generated by an ordinary Bunsen carbon and zinc battery and then led through a transmitter, which was kept in a case no larger than a good-sized cigar box, into the ground. Thence the impulses speedily traveled to their destination where the receiver was waiting. In both the transmitter and receiver are imbedded the secrets of Armstrong and Orling's inventions.

Advance proofs of the price lists show the charge for transmitters for sending Morse signals short distances will be $50 and $75 for long distances in addition a royalty of $5 per year. A complete telephone outfit for short distances may be purchased for $20 with a yearly royalty of $5.

In case of burns or scalds cover the burned section with cooking soda and lay wet clothes on the burn. Other good remedies are white of egg and olive oil; olive oil or linseed oil, plain or mixed with chalk or whiting; sweet or olive oil and lime water.

Clerks of the navy department are nearly demoralized because of the rule of Mr. Moody that salaries shall be governed by the amount of work that passes over the clerks' desks, and that their compensation shall not in any way be controlled by the amount of influence back of them.

# Novel Concrete Sewer Construction

Syracuse Concrete Sewer in Course of Construction.

There has recently been completed near Syracuse, N. Y., for a large manufacturing concern, a very remarkable sewer. This sewer has to take care of 20 million gallons of water per day, which is used by the company for cooling purposes. The sewer is 2,000 feet long and in its construction was used over 50,000 square feet of expanded metal. The metal is placed to form the shape of the tube and cement concrete placed on the inside and outside of the metal to form the thickness desired, being held in position until hard by wooden forms which are then removed. This makes a continuous tube without seams or joints.

Expanded metal is a unique material in the mechanical world. It was designed and invented with a view to a special purpose, to which it has been put to a very large extent, but it nevertheless found a very new and unexpected purpose and place of usefulness wherein it has achieved still greater distinction. Though apparently simple in the possibility of its manufacture, it has nevertheless required great skill to bring it to a point of commercial perfection. It is nothing more or less than plain sheets of steel, slit in regular lines and opened into meshes of any desired size or section of strand. The operations of shearing the steel and opening the meshes are simultaneous and are performed when cold. No material is wasted, and there are no pieces cut out. It was originally termed by the inventor "slashed metallic screening," and was intended as a material for fencing, window guards, etc. It is probable to-day that less than one per cent of the output is used for the originally intended purpose, the greater part of it now being used in all kinds of building construction. The finished sheets of the material are from three to eight times as large as the original sheet of steel, according to the size of mesh, and they are produced with a uniform length of 8 feet, the width ranging according to requirement from 12 inches to 6 feet. The material is cut from steel, as light as 27 gauge, with meshes 3/8 inch, in which form it is used for lathing, and from that size to sheets cut from No. 4 gauge steel, with diamond meshes 5x12 inches, with many intervening sizes and widths.

There are in this country five large factories operating to their full capacity, besides seven other companies devoted to the sale and construction of the material in various forms, and known as the Associated Expanded Metal Companies. There are also half a dozen or more companies on the continent of Europe, besides one in Australia. It is probable that in this country alone the output for the present year will amount to more than 20,000,000 square feet of the various kinds produced.

## DOG'S BONE IN MAN'S LEG.

### Wonderful Operation of Transplanting Living Bone.

The science of bone grafting has advanced wonderfully during the past few years. The Journal of the American Medical Association describes an interesting case in which the leg bone of a living dog was bared and grafted to the damaged bone of the lower part of a man's leg. The dog and the man became very much "attached" to each other. The dog soon learned that moving was equally painful to them both and kept quiet. The two legs were kept in position by a plaster of paris splint. At the end of five weeks the dog's bone had grown on to the man's bone. The cast was removed, the dog was then detached and the man had a new live bone. A few weeks later he walked with the assistance of a cane. This is reported to be the first successful case of what is called bone transplanting by vascular attachment from animal to man; and is doubtless more interesting to the man than the dog.

# Popular Mechanics

**Published by Popular Mechanics Co.**
**Journal Building, - - - Chicago**

**SUBSCRIPTION**

***United States, Canada, Mexico and all U. S. Possessions, per year*** ..... ***$2 00***
***Foreign Countries, post paid*** ..... ***3 00***
***Monthly Edition*** ..... ***1 00***

**Long Distance Telephone Main 2682**

Popular Mechanics is an illustrated weekly review of the mechanical and engineering press of the world, presented in plain, simple language, and condensed as much as possible. We always credit publications from which illustrations and facts are taken. Where the name only of such publication is given, it indicates we have used practically the entire article. Where name of publication with date of issue is printed, we have made only a brief digest, and those of our readers who desire to study all the details of the subject should procure from its publishers, or their local newsdealer, the copy of that date

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**POPULAR MECHANICS**
**Journal Building, - - Chicago**

Entered at the Chicago Postoffice as Mail Matter of Second Class.


## PRIZE OFFERED FOR A WELL.

The American Consul General A. D. Barlow, City of Mexico, reports the offer of a prize of $2,075 American money to the person or company which within three years shall drill and have in operation an artesian well in any of the following Mexican towns: Oaxaca, Xochimilco, San Felipe de Agua, and Hacienda de Aguilera. The enterprise will be free of taxes for 10 years, and all workmen exempted from personal tax. The well to belong to the promoter under a franchise.

In case of sun stroke loosen the clothing; get the patient into a shade and apply ice cold water to the head; keep the head in an elevated position.

## RAILROAD RACERS AND THE WHEEL PROBLEM.

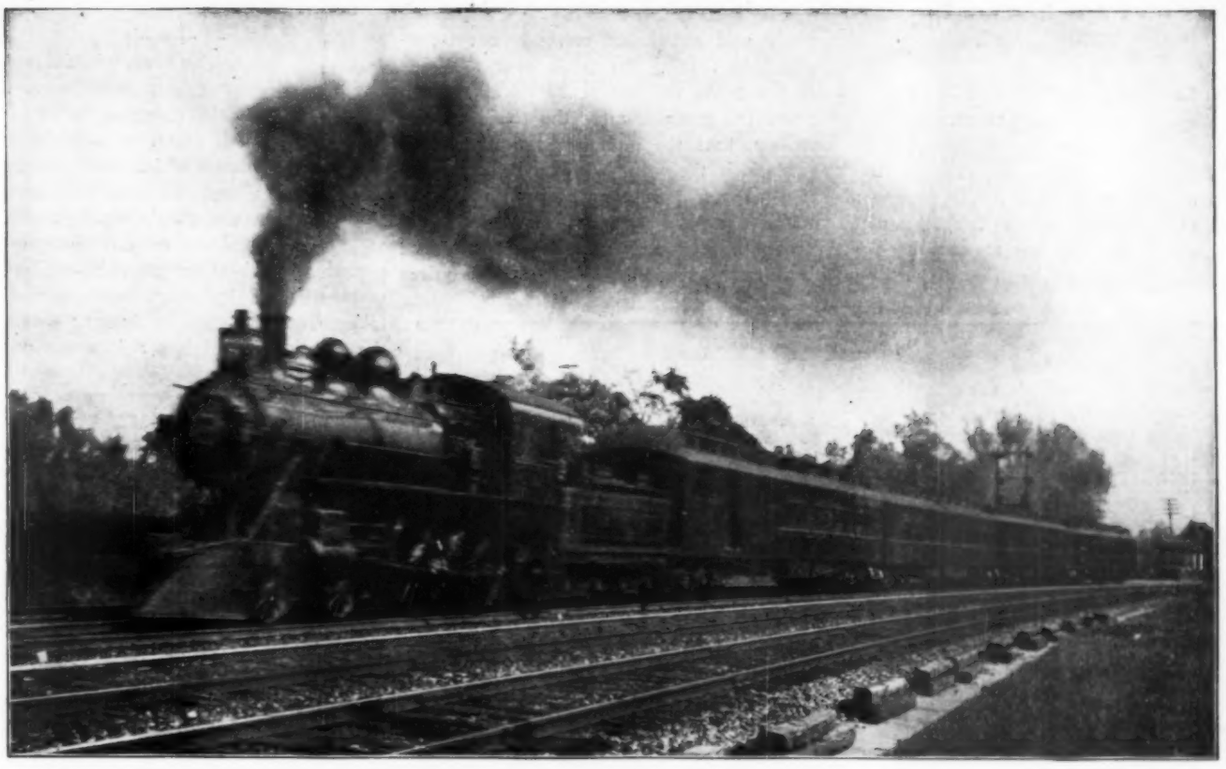
**Prospect that the 20 Hours from Chicago to New York May be Reduced to 16 Hours.**

Popular Mechanics recently announced that two great railroads running between Chicago and New York would put on flyers which would cover the trip in 20 hours. This has been done and we present a picture of each train. The one showing the Pennsylvania train was taken while running at full speed. In connection with this picture the Railway Age takes occasion to use it as a rare illustration of the top of a wheel moving the fastest and says: "If the reader will look at the photograph, taken while the train is going at full speed, and particularly notice a driver, he will see that the bottom of the wheel and the lower spokes are quite distinct, while the spokes above the axle are blurred, this effect increasing to the top.

"To explain this, suppose that the train is running at 60 miles per hour. A point on the rim of the wheel is moving with this velocity. Now, as the bottom of the driver goes backward with the same linear velocity at which the train moves, the line of contact between the wheel and the rail is still for a small space of time. The center of the wheel goes forward as fast as the train, and the upper end of the diameter has this same velocity, and in addition that due to rotation about its own axis, which is equal to the speed of the train. Hence the point at the top goes forward around the line of contact between the wheel and the rail as a center with a velocity of 120 miles per hour for an instant of time. So, then, a particle on the rim of the wheel, in regard to the track, has a changing linear velocity from zero to that of 120 miles per hour and back again in each revolution."

The time made by the New York Central has been very satisfactory and already suggests the possibility of a further reduction to 16 hours. Recently to make up for a delay caused by a freight accident, the "Twentieth Century Limited" made the following time: Brockton to Cleveland, 134 miles, in 131 minutes; Cleveland to Toledo, 113 miles, in 103 minutes; Toledo to Elkhart, 133 miles, in 115 minutes; Elkhart to Chicago, 101 miles, in 111 minutes, but this included slow downs for 14 crossings and three towns and slower running coming into Chicago. The 481 miles was made in 460 minutes.

New York Central "Twentieth Century Limited" Train, Between Chicago and New York.



The Pennsylvania 20-Hour Train—Photographed While Running 65 Miles an Hour.

## MECHANICAL SEA SERPENT STARTLES GUESTS.

### Hotel Man's Delusion Has Every Appearance of a Real Marine Monster.

The mechanical genius of a Bath Beach hotel man caused many of the hotel guests to delight in the delusion that they had witnessed a real summer resort sea serpent. Every one at the Fort Lowry hotel is authority for the statement that, regarding the appearance of the monster at least, there could be no possibility of doubt. It was at about 9:30 o'clock when the men and women guests were chatting merrily on the hotel piazza that the monster, gleaming like colored fire, rose from the waves about a dozen yards from the end of the Bath Beach pier. A phosphorescent fire, green and ghastly, glistened from its scales as it slowly made its way toward the guests. Some crowded to get a closer view and some of the women screamed in awe. The monster darted in and out of the water, changing its course, and leaping clear of the water as it made for the open bay. "It's a phosphorescent porpoise," said Nathan B. Appel, a guest of the hotel and who is supposed to be an authority on fish.

The whole town was excited over it. Further investigation revealed beyond a doubt that Mr. Platz, a couple of fellow conspirators, a carpenter, a fish-shaped log, some luminous paint and phosphoric oil, two or three hundred yards of small rope, a block and pulley, and a boat at anchor out of sight in the bay were the incidentals to the appearance of the mysterious creature.

## CLAY WORKING A BIG INDUSTRY.

The manufacture of clay products is now one of the largest industries in the country. From a handful of bricks with which to build a kitchen chimney it has grown to a great variety of purposes. Fence-posts, railroad ballast, and coffins are among the things now made of burned clay. Last year the clay products of this country amounted to over $110,000,000. Of this, $51,000,000 was for building brick; there were more than $5,000,000 spent for paving brick, and nearly $10,000,000 for fire brick. Of pottery there was over $22,000,000 sold. Every state and territory except Alaska makes things out of clay and Ohio leads with an output last year of $21,574,985; Pennsylvania comes second; New Jersey, third; then Illinois and New York.

## TOOK 45,000,000 YEARS TO BUILD CORAL REEFS.

It has required much more than 45,000,000 years to build the coral reefs in the ocean according to the recent estimates of scientists. Sir J. Murray and Prof. Agassiz contend that 150 feet is the greatest average depth at which reef corals can live. Then comes the question: "How much material in the shape of marine deposits (chiefly contributed by chalk animalcules) and what extent of time would be required to bring a foundation up to within a requisite distance of the surface to afford a base of operation for the coral polyps?" Sixteen tons of chalk are contained in a layer of sea water 600 feet deep and a mile square and this material may be utilized by the chalk animalcules for shell building purposes. If this amount of chalk were precipitated over a square mile the layer it would form would be less than .0001 of an inch thick. How long would such an agency take to build up a base for coral rock from the sea depths? Every year the accumulation on the ocean bed would not exceed 1-9000 of an inch in thickness, giving one foot of thickness in about 100,000 years. Then if we suppose that a foundation has to be built from a depth of 600 feet to the limit of coral life, we would require 75 fathoms of material at least and at the rate of accumulation just given, such an erection would require 45,000,000 years for its completion.

Coal dealers predict that unless the miners' strike is settled before Sept. 1, the price of anthracite will take a big jump and the famine will be felt all over the country.

The New York Central is to substitute electricity for steam on its lines within the city limits of New York.

## PULLS WHOLE RAILROADS FROM THEIR BEDS.

### Queer Contrivance That Hauls Down Tracks From High Grades.

Pulling down miles of railroad track from a high to a lower grade is now almost as simple as child's play as a result of a new device that has recently been put in service in the road bed improvements on the Grand Trunk railroad. The device is known as the Lidgerwood unloader. Its principal equipment is an engine, an anchored flat car and a cable. The cable is stretched from the flat car to the track to be moved and fastened about the rails. The engine is started and the track, pulled by the cable, crawls down from the high grade and is stretched out in a leaning posture along the side of the embankment. The engine then reverses its course and pulls the track from its slanting position along the side of the embankment to the level ground of the lower grade, leaving it sufficiently well aligned and graded for work trains to run on.

Ready to Throw Track—Before Pulling.

Same Track After Being Pulled.

This new process does away with the old system of throwing track with a gang of men and crow bars. That was a tedious, costly and antiquated method in comparison. In forcing the track over the edge of the bank, the rail could stand so high above the ground, after the ties began to project, that the men could not obtain a hold with their bars. The Railway Review, a world-wide authority on railway matters, says:

"To throw a mile of track laterally and to a lower grade by hand labor requires the services of a large gang of men for a whole day, and the average expense on this road has been about $175 per mile. By using the unloader the track can be shifted to place at a cost of about $43 per mile, the ordinary distance being 15 ft. laterally and an average of 10 ft. vertically. The time required to do the work in this manner averages 7½ hours. The expense stated covers the use of the unloader, a locomotive and crew, four laborers and one foreman.

"When one side of the cut has been excavated, the old track is thrown down to the lower level to be used for a loading track in excavating the other side of the cut and a new track is usually built to carry the traffic."

## CHARGING STORAGE BATTERIES.

A great many good commercial storage batteries are ruined because of improvident charging. Lack of charging, if continued long enough, will result in sulphate forming on the plates which is indicated by white patches, says Electrical Review. In this condition the cells should be charged at half rate until the sulphate entirely disappears. Pure water should be added to make up loss by evaporation, care being taken, however, that the specific gravity of the solution is not lowered to any considerable extent.

## THE ORIGIN OF ICE CREAM.

Ice cream dates back to the beginning of the 17th century, says What to Eat. It was invented in Paris by an Italian and called iced butter. Ice cream made its appearance in America at Philadelphia about the time of the Revolution, but was only seen on state occasions and was a great luxury. Incredible as it seems, ice cream may be fried in smoking hot fat, or baked for a few minutes in a very hot oven. When so treated it is called "Baked Alaska."

## TO TELL THE AGE OF A HORSE.

Here is a wrinkle in the telling of horses' ages that is worth remembering: After the eighth year the horse has no more new teeth, says Dental Hints, so that the tooth method is useless for telling the age of a horse which is more than eight years old. As soon as the set of teeth is completed, however, a wrinkle begins to appear on the upper edge of the lower eyelid, and a new wrinkle is added to each year, so that to get at the age of a horse more than eight years old you must figure teeth plus the wrinkles.

## SUMMER OUTING IN A CABOOSE.

An old caboose fitted up as a jaunting car carried four young western college chums through the Southwest on a vacation which has just ended. The outing period lasted four weeks all of which time was spent in the caboose, stops being made at interesting points. The party consisted of B. L. Winchell, Jr., of St. Louis, son of the vice-president and general manager of the Frisco; W. F. Larsh, Harold Fulwiler and Hal Chaney of Denver. They were college chums and before separating at the close of school decided to rough it for a while. The caboose is fitted up with a range and camping utensils. The young men did all their own work, cooking, carrying in wood, etc., and their roughing garb consisted of overalls and jumpers.

Lady—Did you ever try to get work?

Tramp—Yes, ma'am; I got a job for me brother once.—Baltimore World.

## MAKE MOVING PICTURES TO ORDER.

Moving picture factories are now appearing in Paris and London and one is soon to be established in New York. These factories guarantee to give graphic scenes "from real life" of any occasion. The scheme leaked out through a Paris newspaper correspondent. Impressed with the scene of a cavalry charge that appeared to a mother in a dream he went out to investigate. The result was the discovery of a factory near the Park St. Maur. King Edward's coronation procession passed there two days before the king's illness was announced and was ready to be displayed in the Paris, Vienna and Berlin music halls and vaudeville houses on the night following the coronation.

## GOOD TIMES FOR INVENTORS

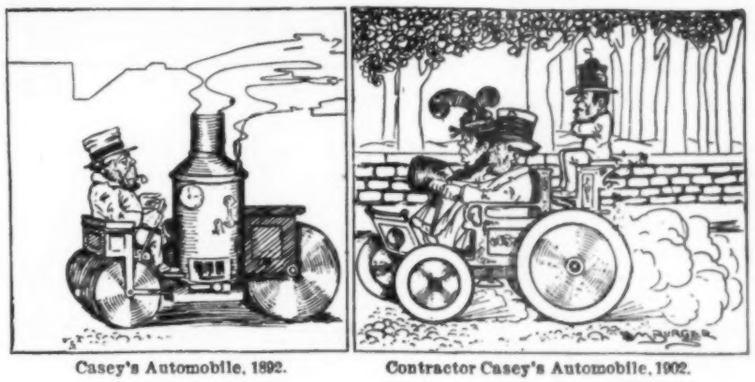
Capital is beginning to seek desirable inventions and we may soon witness a return of the balmy days when patents made quick fortunes. It is reported the United States Steel Corporation has offered $50,000 for a new rail joint patent. The inventor wants $100,000. John W. Bookwalter, of Springfield, O., is said to have just refused $1,000,000 for his new steel process.

Recent publication of a statement that not a passenger was killed on English railroads in 1901, has brought out a claim for the Mexican National that that road, with its branches aggregating 1,200 miles in operation, has for more than 20 years never killed a passenger, though it climbs more mountains and turns more curves than any road in the United States.

Automobiles are not allowed in the Yellowstone National Park. Too much danger of scaring horses on the mountain roads, many of which overhang deep canyons.

## PANAMA VS. NICARAGUA CANAL.

The best statement of the comparative advantages of the two routes, which we have seen is taken from the report of the eminent engineer, Mr. Bunau Varilla, which was given out just before he sailed from New York recently. The diagrams are from the Railroad Gazette.



Casey's Automobile, 1892. Contractor Casey's Automobile, 1902.

## ELECTRIC "FIREFLIES" ON THE STAGE.

A most unique deception which gives the appearance of a whole army of fireflies turned loose on the stage is witnessed at the Dearborn theatre in the presentation of the Storks. What appears to be the swarming fireflies, however, are only twinkling tiny electric light bulbs hung at different heights by invisible wires. The illusion is the conception of F. H. Raeder, the theatre electrician. The Western Electrician says:

A long, narrow wooden box extends across the stage above the sky-line. Through this box is strung the main distributing line, which has 21 connections with smaller wires, and these fine wires, invisible to the audience, extend downward, through holes in the box, and terminate in two-candlepower incandescent lamps. These tiny lamps are connected so that they may be operated separately from the floor of the stage. As the current is turned on and the different bulbs are made to twinkle in exact imitation of a firefly, the whole device is swung in a line across the stage, giving the impression that the luminous insects are moving about, thereby creating a most realistic effect.

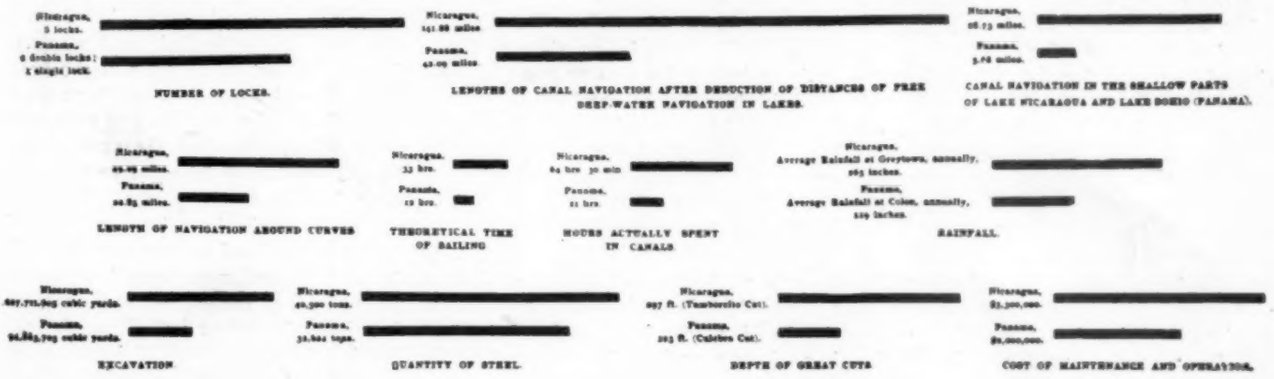
Prices are advancing in Canada. The advance in a year has been: Carpenter work, 20 per cent; masonry, 15 per cent; plastering, 15 per cent; decorating, 10 per cent; iron work, 15 per cent; plumbing, 20 per cent.

## NEWEST RIVAL OF HOLLAND SUBMARINE BOAT.

The Holland submarine boat, which has long enjoyed pre-eminence in the United States, must look to its laurels as a result of the new type of boat invented by Claude Goubet. The Holland boat has a reserve buoyancy when submerged, and is kept under by means of horizontal rudders. The Goubet boat possesses no reserve buoyancy when beneath the water, its weight equaling its displacement. The new type, in fact, weighs nothing when submerged, and it is said that the addition of a very small weight will set it sinking. In order to keep the boat on an even keel and prevent it either rising or sinking, the inventor has devised an arrangement which pumps water from a forward tank to one situated aft, and vice versa.

Should the vessel incline in any direction, a pendulum swings forward, and in so doing forms a connection between a motor and the batteries; the former at once commences working the rotary pump in a direction which causes the water to flow through the pipes from the lower tank to the higher, until the addition of water to the latter is sufficient to bring both the boat and tanks level again. The pendulum swinging straight then cuts off the electric current and the motor instantly stops.

Prices were materially advanced at the last meeting of the Shafting Association.


Nicaragua, 5 locks.
Panama, 6 double locks; 1 single lock.
NUMBER OF LOCKS.
Nicaragua, 141.88 miles.
Panama, 49.09 miles.
LENGTHS OF CANAL NAVIGATION AFTER DEDUCTION OF DISTANCES OF FREE DEEP-WATER NAVIGATION IN LAKES.
Nicaragua, 26.13 miles.
Panama, 5.06 miles.
CANAL NAVIGATION IN THE SHALLOW PARTS OF LAKE NICARAGUA AND LAKE ONEIO (PANAMA).
Nicaragua, 22.05 miles.
Panama, 20.83 miles.
LENGTH OF NAVIGATION AROUND CURVES
Nicaragua, 32 hrs.
Panama, 19 hrs.
THEORETICAL TIME OF SAILING
Nicaragua, 64 hrs 30 min
Panama, 21 hrs.
HOURS ACTUALLY SPENT IN CANALS
Nicaragua, Average Rainfall at Greytown, annually, 163 inches.
Panama, Average Rainfall at Colon, annually, 129 inches.
RAINFALL.
Nicaragua, 667,771,803 cubic yards.
Panama, 96,853,705 cubic yards.
EXCAVATION
Nicaragua, 40,500 tons.
Panama, 32,802 tons.
QUANTITY OF STEEL.
Nicaragua, 197 ft. (Tamborcito Cut).
Panama, 103 ft. (Culebra Cut).
DEPTH OF GREAT CUTS
Nicaragua, $2,500,000.
Panama, $8,000,000.
COST OF MAINTENANCE AND OPERATION.

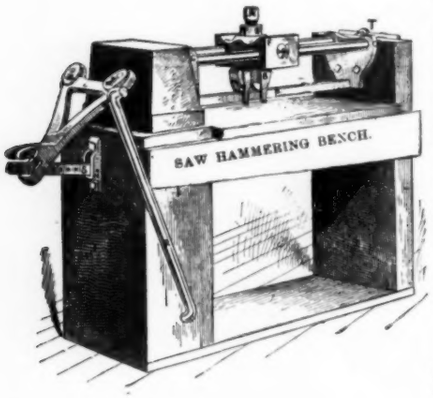
# SHOP NOTES

## HOW TO FIGURE ON PAINT.

As good a rule as any in estimating the amount of paint needed for any given surface is to divide the number of square feet by 200. The result will be the number of liquid gallons needed for two coats, says Artistic Homes Ideas. Go over any spots, particularly if they are greasy, with a saltpeter wash before the paint is put on. They will then take the paint.

## MAKES SAW HAMMERING EASY.

A saw hammering bench which will prove a boon to saw mill men has been invented by a Mississippian. With this device there is no lifting or holding up of the saw for testing with straightedge or gage. The bench can be set or taken down in 15 min-




utes and may be packed in an ordinary tool chest.

The opposite edges of saw are supported on casters. A thumbscrew secures the centering head, so the saw, when clear of anvil, may be rotated in either direction and adjusted accurately and quickly with little exertion. The centering head is carried on an anti-friction trolley.

## SOLDERING A STRAINER ON A WELL PIPE.

A New York plumber was employed to solder a perforated brass wire strainer over a 10-foot length of 6-inch galvanized iron pipe which was perforated with 180 holes of 1½-inch diameter. To do the work with hot coppers alone would be a tedious job, as the perforated wire was in sections of 14 inches and the big pipe was cold. The Metal Worker tells how the man did the work in one-fourth the usual time.

In addition to the seams where the ends met the brass had to be soldered to the pipe at each end throughout the entire circumference. In order to expedite matters two fire pots were used, one for heating the soldering coppers, while the other pot was placed immediately under the pipe, which was supported conveniently for the purpose. By this means the heat of the fire pot heated up the pipe so that comparatively small coppers were capable of soaking the solder into the sections so as to make a substantial and durable job.

## ELECTRIC TREATMENT FOR PRESERVING WOOD.

An Austrian inventor has discovered a new process of preparing wood for building purposes which is described in The Draftsman. Green wood is placed in a large wooden trough whose bottom is covered with a lead plate. This is connected with the positive pole of a battery. Covering the wood is a second lead plate which forms the negative pole. The wood is then subjected to a bath in a solution composed of ten per cent rosin and seventy-five per cent soda. Under the influence of the electric current, the sap is drawn out of the wood and rises to the surface, the solution being absorbed by the wood. The operation requires from five to eight hours. The treated wood is allowed to dry for about two weeks.

## TRANSMISSION OF HEAT IN IRON.

In the process of steam making the initial step is the generation of heat force. The next is the transmission of this heat force to the water. By reason of its nature and formations, it is necessary to place and to retain the water that is to be changed into steam within an iron boiler, says Geo. T. Zimmerle in the Age of Steel. The heat being applied to the iron is carried through it by conduction. When the heat force applied is very strong or intense it must be transmitted or conducted very rapidly or the iron will melt and burn, and if the iron is of such thickness that the heat cannot pass rapidly through it, the same result will occur. In ordinary practice the thickness of the boiler plate iron ranges from three to five-eighths of an inch. One of the professors in the State University of Minnesota believes boiler plate could be made an inch and a quarter to an inch and one-half thick before the limit of conductivity would be reached in ordinary furnace heat. Soot on the outside of the iron decreases the transmission of the heat.

An illustration of this may be had by considering the action of a pile driver sinking piles in a river bed. The impact of the hammer at the top end of the pile imparts a force which is conducted through its entire length to the lower end, where there is an impact against the soft mud at the bottom, causing it to be displaced and allowing the pile to sink. If there should be placed on top of the pile rubber cloth or felt or any substance of an elastic or yielding nature, the force of the impact of the hammer would be absorbed by this matter and the distance that the pile would be driven into the mud would be lessened. If the lower end or point of the pile should come into contact with rock or a hard clayey formation, its progress would be hindered, even though the force applied was sufficient to batter and split the head of the pile where the force was applied—the transmission of force being due not only to the direct application of the same to the head of the pile, but also to the receptive nature of the ground into which the pile is driven. In a similar manner, transmission of heat force is dependent on the receptive nature of what is on the inside of the iron to the outside of which the heat force is applied.

## GOVERNMENT OF HEAT AND AIR SUPPLY.

We hear a great deal about proper ventilation, and heating of shops, foundries and factories in these days, remarks an exchange. It is with the physical properties of air rather than with its chemical composition, that the ventilating engineer has to deal. It is a property of air that it expands about 1-500th part of its volume at 32 degrees for each degree of increase in temperature. If, then, we take 100 cubic feet of air at 32 degrees F., and raise the temperature 50 degrees, we shall have about 110 cubic feet at 82 degrees. This heated air, being lighter than the surrounding air at 32 degrees, tends to rise by the same law by which a cork rises from the bottom of a vessel of water. To this property of air we owe all ventilation, natural or artificial. Now, then, in giving general directions for heating and ventilating your shop or your foundry by either hot air furnaces or indirect steam, I would say: Make your outside inlet of fresh air large—at least six feet square for each room. Admit the air through these inlets to a fresh air chamber. Take the air to the furnace or steam coils as directly as possible from this chamber without ducts. If a furnace is used, set it over a pit at least two feet deep, and admit the air to this pit in such a way that it will pass up on all sides of the firepot. If you heat by cast iron radiators, do not double-bank them, and in any case spread your radiators so that the area of space between them may be equal to that of the ducts leading to the rooms. Make your warm air supply ducts large—at least five feet cross sectional area or one square foot for each ten workmen. If you heat by steam place a coil of steam pipe, 15 to 25 square feet, in each viaduct just above the opening for the air.

## MARVELOUS CURES FROM SUN BATHS.

### Open Air Institution in Berlin Where Patients Discard Clothing, as Injurious.

An open air institution in Berlin is working wonders in curing men and boys of various kinds of ailments, such as paralyzed limbs, neuralgia, rheumatism, locomotor attaxia, and nearly all nervous affections. It is called the "Light Air Sport Bath." It is founded on the theory that clothing is a detriment to health and the patients are required to wear nothing on their bodies while taking treatment except very light bathing trunks. It is an open space, fenced in and equipped with all the appliances of a gymnasium, tennis court, etc. All around the grounds is an open corridor provided with refreshment booths, shower baths, and seats. The grounds are open the year round, and many of the more hardy go there to disport themselves when the snow is falling. In the summer time the sun baths are said to be the great source of cure, which is many times aided by the benefits of the exercise and shower baths. The institution was inaugurated by a company of vegetarians.

## ALCOHOL-ELECTRIC CARS.

In connection with the numerous purposes to which alcohol is being adapted as motive power in Germany and France, is an attempt to use it on street cars. A small generator is placed on the car and driven by an alcohol engine. This generator feeds into storage batteries, and the expectation is that when the car is standing or going down grades, the engine will produce enough extra current to keep the batteries fully charged. The idea is attracting considerable attention abroad, but is not new. Efforts were made for 10 years to do the same thing in this country, using a gasoline engine instead of alcohol. They were failures.

## CARNEGIE'S PHILOSOPHY.

"It is not from the sons of the millionaire or the noble that the world receives its teachers, its martyrs, its inventors, its statesmen, its poets, or even its men of affairs. It is from the cottage of the poor that all these spring."

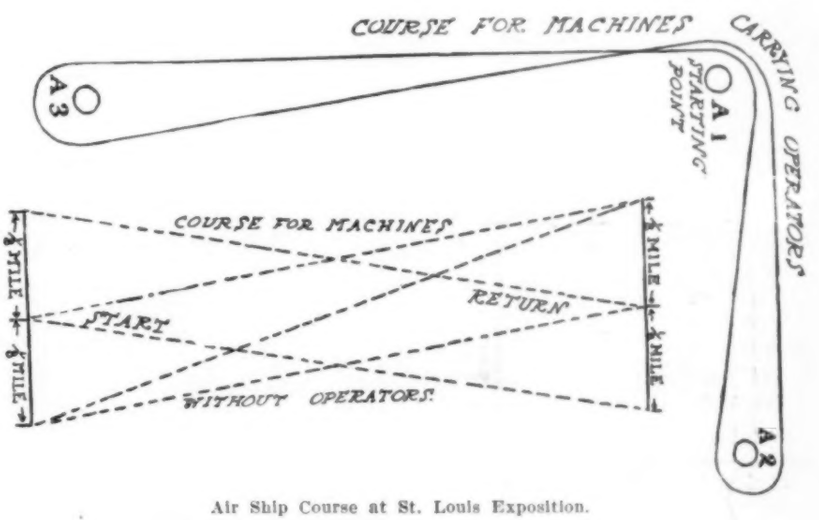
Johan Bedini, the juggler, who once caught a turnip on a fork held in his mouth, the turnip being dropped from the garden of the Masonic Temple in Chicago, 22 stories, gave a similar performance in San Francisco the other day. Eight turnips were dropped from the 15th floor of the Claus Spreckles building, the last being impaled on the fork held in Bedini's teeth.

## THE GREAT AIR SHIP RACES AT ST. LOUIS.

St. Louis is to expend $200,000 in the air ship race which bids fair to be the greatest attraction ever offered in any country. The contest is open to the world. The winner will get $100,000 in money and a suitable medal, diploma or certificate. There is $50,000 offered in subsidiary prizes and $50,000 set aside for expenses incident to the contest.

The prescribed course will begin and end in the athletic amphitheater adjoining the acronautic stabling ground in the exposition inclosure. The course will be shaped like the letter L, one leg being the shorter and in full view from all parts of the exposition grounds. It will be marked by three captive balloons (at points marked A-1, A-2, A-3 in diagram.) The starting point will be at A-1. The aeronaut shall have his choice of the direction in which to start, but he shall turn around the captive balloons A-2 and A-3 in opposite directions—i. e., one to the right and the other to the left. The length of the entire course will not be less than ten miles nor more than fifteen miles, reckoned in an air line from center to center of the captive balloons. The course thus described is for machines carrying operators.

For flying machines not carrying operators the judges will establish two parallel base lines one-fourth of a mile long and at least one mile apart. These lines will be laid out on the day of the trial and with reference to the prevailing wind, if any. The machine will be started from the center of the leeward base line and at right angles to it, and shall proceed against the wind. It shall cross the other base line before landing, and may then be caught and started back from the center of the windward base line, proceeding down the wind and crossing the leeward base line, practically as indicated by the dotted line diagram. The judges may, in their option, order that the competition for this prize shall be made in a calm.




Air Ship Course at St. Louis Exposition.

## HOW TO TELL A REAL NAVAJO.

A recent traveler in the southwest lately told the writer that he had learned from an old squaw how to tell beyond a doubt whether a blanket or rug was a genuine Navajo weave, says The Furniture Journal. Several young Indians were having a sharp discussion over a blanket as to whether it was woven in Mexico among the Pueblos or by the Navajos. An old squaw came in, felt of the edge carelessly, and said contemptously—"Navajo."

In the genuine article the edge is as firm as a board, while the inferior Mexican weaves have an insecure and soft binding. This test is said to be infallible.

## ANDRE MURDERED BY ESKIMOS.

The Rev. Dr. Ferlies, a Church of England clergyman, who recently arrived in Winnipeg from York, Northwest British Territory, brings what he says to be authentic information as to the fate of Explorer Andre and his companion.

Two years ago, 1,700 miles north of York, a party of Eskimos under the leadership of "Old Husky," saw the Andre balloon light on a plane of snow in that vicinity, which is about thirty miles north of Fort Churchill. Three men emerged from the balloon and some of the "Huskies" people approaching them out of curiosity.

As they did so one of Andre's companions fired off a gun. This is a signal to uncivilized natives for battle. It was regarded as a challenge and almost instantly the natives fell upon the three explorers and massacred them. Everything pertaining to their expedition was carried to the homes of natives on the border of the arctic region.

# Summer Course in Easy Mechanics For Boys.

**By Wilbert S. Drew.**

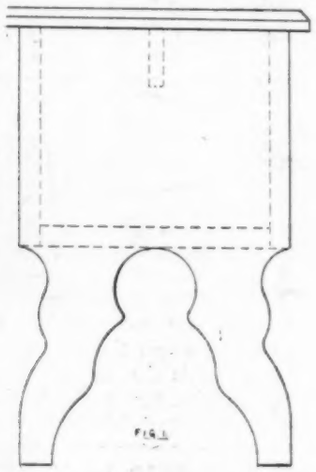
[This series, commenced in issue of June 28, will continue each week. It will give instructions which any boy can understand, how to use carpenter's tools and make things. In doing this only a few tools will be required, and cost of material will be small. The articles to be made will include a boat, table and similar subjects.]

## A STAND ON WHICH TO POLISH SHOES.

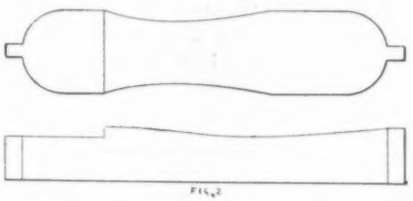
This stand is 10 inches wide, 14 inches long and 16 inches high. It looks best when made of hard wood and polished, but also makes a neat appearance when made of soft wood and painted or stained and varnished.

Fig. 1 is an end view of the stand, Fig. 2 is a drawing of the footrest and Fig. 3 shows all the parts assembled.

Use stock ¼-inch thick and begin by laying out the ends as shown in Fig.. 1. The legs can be sawed out with a key-hole saw but if you have a jig saw or a band saw at your disposal it will be more expeditious to



use that. After sawing the legs to shape they should be leveled off at the corners with a coarse half-round file or wood rasp and nicely finished with sand paper. Now cut out the notch shown by the dotted lines at the middle of the upper part of end pieces. This notch is to be ½ inch wide, ⅜ inch deep and 2 inches long and is in the inner side of the piece. Its object is to receive the projections on the end of the foot rest and hold it in place. The front and back are each 12½ inches long and 8½ inches wide. These parts may be put together with round-headed screws 1⅜ inches long and as previously explained, holes should be bored for them and the threads of the screws filled with soap, the softer the better, before putting them in place. The cover should be 11½x15½ inches and may be made in one piece and finished like the rest of the stand, or it may be made with an outer frame of four pieces (see Fig. 4) halved together at the corners and grooved to receive a panel ⅜ inch thick in the center. The outer upper edges are bevelled off as shown in Fig. 1 and if the second mode of construction is followed the panel may be set 1-16 inch below the frame of the cover and covered with a piece of Brussells carpet, or the carpet may be padded with



tow. When finished in this way the stand makes an excellent stool.

If a sheet of tin is cut ½ inch larger all around than the inside of the bottom of the box and the sides bent up so as to form a tray ½ inch deep and this is placed in the bottom of the box it will afford a very easy and convenient means of cleaning it out. The tray is removed from time to time and brushed out.

The polishing brush, polish, cloths, etc., are kept in the box.

The foot rest is made of a piece of 2x4 stock, any kind of soft wood will do, and cut to shape with the keyhole saw. The curves on the sides may be cut by holding the block in the vise and using a draw shave, working first from one end of the piece and then from the other end to avoid cutting too far. The end projections on the foot rest should be just long enough to fit

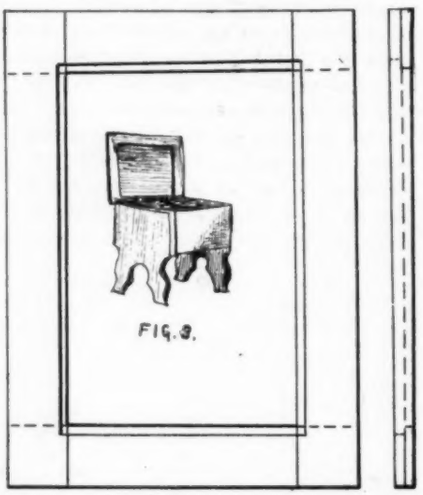


FIG. 4

into the grooves cut in the end of the stand and should be just wide enough to make a nice sliding fit so that the rest can be easily removed when it is necessary to clean out the box.

Secure the cover with a pair of brass hinges 1 inch or 1½ inches long.

By request of a reader the next article will take up the building of a canvass canoe. It is not so simple as our correspondent seems to think but if directions are carefully followed a good degree of success ought to be attained.

## CORONATION GIFT STOLEN.

### Ancient Bell Taken By Pirates Again Purloined By New York Thieves.

An ancient bell which is believed to have been stolen by pirates more than a century ago was dug from tropical waters and brought to New York, where it once more fell into the hands of thieves. The bell was intended as a coronation gift for King Edward. On it was inscribed "Prince of Wales, 1740." It was found imbedded in a reef near Kingston, Jamaica, and was brought to New York by the British schooner Attractor, together with a number of English, Spanish and Mexican gold coins, to the amount of about $10,000, which were found under water in the same locality. It is believed that the bell and the coins were plunder taken by pirates from some ship named the Prince of Wales. The crew of the Attractor thought the valuables would be safe from pirates hands when once on board, but they did not take into mind the wharf thieves of New York. The afterhatch of the Attractor was not securely fastened and river pirates at night hoisted the old bell by a hauser from the schooner and made off with it.

## DETAILS OF SHIPYARD COMBINE.

Details of the proposed consolidation of shipbuilding interests show that the concern will be incorporated under the laws of New Jersey with a capital stock of $20,000,000, equally divided in common and preferred shares, and that the name will probably be the United States Shipbuilding company. The following concerns will be taken into the new company: Union iron works, San Francisco; Bath iron works, Bath, Me.; Hyde Windlass company, Bath, Me.; Crescent shipyard; Samuel L. Moore & Sons company, Elizabethport, N. J.; Eastern Shipbuilding company, New London, Conn.; Harlan & Hollingsworth company, Wilmington, Del.; Canda Manufacturing company, Cateret, N. J.

The directors will include: Charles J. Canda, Lewis Nixon, E. W. Hyde, Henry T. Scott, John S. Hyde, C. H. Hanscombe, Irving M. Scott, H. W. Gaus.

Contracts for construction on hand amount to $36,046,000 Net profits for the next eighteen months are estimated at $2,675,000, and during the next three years $6,675,000.

## MOVING VANS FOR TRANS-OCEANIC USE.

### Furniture May Be Loaded in Them at Your Door and Not Unpacked Until It Reaches Europe.

By H. W. Harris, United States Consul at Manheim.

Vans for moving household furniture from one city to another are much more common in Germany and other parts of Europe than in the United States. These vans, which are owned by companies with agents in different cities, are loaded with furniture and other household goods at residences, hauled on trucks to the railroad, and loaded on flat cars for their destination. Here, they are received by the company's local agents and are unloaded at the house where the furniture is to go. When possible, the van is reloaded in the same vicinity and sent back to the place of starting. Thus, one may see in Italy or France furniture vans from Berlin or Dresden.

The saving in packing, the avoidance of extra drayage, and of the danger of breakage, have made the system popular, especially in Germany. The vans in use here vary somewhat in size, many of them being almost as large as an American box car.

Recently, efforts have been made to extend the system so as to provide for the shipment of household goods across the ocean. A New York storage and van company has established connections in various parts of Europe and proposes to send vans abroad when satisfactory arrangements can be made. If a man living in New York, for example, wishes to remove to a city of Germany, he will be furnished with one or more vans, in which his household goods are placed. The van is transferred to the ship, and, on landing at the foreign port, is again transferred to the railway flat car or river boat and carried to its destination.

The agent of the New York company, who recently made a tour of the Continent, claims that in the short trial made, the use of the vans has proved highly satisfactory, both in cost and convenience.

The vans employed by this company are 16 feet long by 8 feet wide and about 6 feet high. They are solidly built of wood, specially selected for protection against dampness, and are covered with thin sheet steel. They are readily conveyed onto and from ships and railway cars by the usual hoisting apparatus.

As a new phase of international commerce, the matter will be watched with interest.

## LAUNDRIES OF THE WORLD.

[Being a series of interesting views of Laundries of the World personally gathered by Mr. Charles Dowst, editor of the National Laundry Journal, while studying the Laundry systems of all nations. These views portray the curious and unique customs of many lands.]

IN THE LAND OF DON QUIXOTE.—No wonder the Spaniards are proud of their country. The scene presented is a beautiful one and is near one of the most picturesque spots in all that lovely country. It is near the town of Eiche in the province of Alicante in the south of Spain. The place is noted for the superb growth of palms which encircle it and it only needs the presence of the Arab to complete its likeness to an Oriental city. This outdoor "laundry" is on the Elda canal, a tributary of the Segura.

## SNOW STOPS BULLETS.

Snow may come into use for intrenchments during winter military campaigns as a result of late experiments made in Norway. Near Christiana embankments of loose snow were piled up and bullets from a Krag-Jorgenson rifle could not penetrate the snow more than a yard and a half. The same result was obtained no matter from what distance the shot was fired. Military experts, consequently, point out that snow offers more resistance to the penetration of such a bullet than any kind of wood, and almost as much as earth, and that it is possible to use snow as a material for intrenchments and other works during a campaign.

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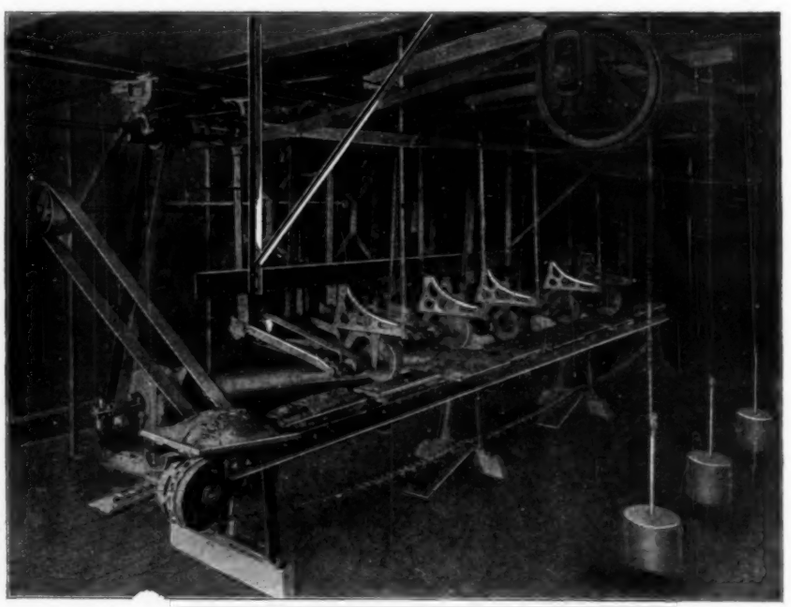
## MARKS A NEW ERA IN METAL POLISHING.

As the result of the installation of a new and remarkable polishing machine at the works of the Art Stove company at Detroit, Mich., half the polishers employed by the concern have been laid off and a miniature strike is the result.

A table or elevated track about 22 feet long and three feet above the ground furnishes the basis of the operation of polishing. Along the center of the track runs a heavy endless chain. By a system of sprockets and cog wheels, connected with the shafting, this chain is made to revolve, traveling the length of the table in about seven minutes. Along this track, and gripping the revolving chain something as a cable car grips its cable, travel what are known as work-holders, arrangements patterned after the follow board used to hold the pattern in a molding shop. These work-holders are of any size necessary, and form a pocket in which is held the piece of casting to be polished.



Machine for Polishing Metals.

As a piece of casting is carried down the track, it is worked upon successively by five wheels, representing the successive processes used in polishing by hand. In order, however, that the work may be done thoroughly, extra wheels are used. At present there are three "roughing" wheels, and two "finishing" wheels. At the farther end of the track, the work-holder is run up on an elevation releasing it from the chain, and is taken out of the way by a caretaker.

The wheels which do the work are fastened to arms, which are connected with an eccentric, giving them a motion backward and forward, like a rolling pin, at right angles with the movement of the track. The wheels themselves revolve at a high rate of speed. The length of this eccentric can be regulated to suit the size of the casting to be operated upon.

Above each of these arms hangs a counterbalance which fixes the tension of the wheels, that is to say, it prevents them from dropping beyond a certain point, and regulates, at will, the amount of pressure to be put on the casting in process of being polished. A flat piece of casting needs less pressure than does a convex piece. In the case of the latter, the wheel is forced to climb a little hill every time it goes over the casting, and this in itself supplies sufficient tension. A blower fixed opposite each wheel does away with excessive dust; while iron braces at the side correct the strain on the apparatus produced by the constant movement in one direction. The track and its supports are made of steel, the remainder of the machine being of cast iron, with the exception of the walking beams for the center balances, which are of wood.

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## STEAM ENGINE OF 2,000 YEARS AGO.

### Ancients Knew of the Power of Steam, But Failed to Give It Practical Application.

By Prof. A. W. Richter.

In the writings of Hero, some 2,000 years ago, we find the first traces of the modern steam engine In his works he describes a machine which is often spoken of as the first steam engine. It consisted of a lower vessel or boiler partly filled with water. A globe was supported above by a pair of tubes which formed a passage for the steam from the boiler into the globe. Two short, bent pipes issued from the sphere at points opposite each other and were open at their extremities. Steam being formed in the boiler by means of a fire underneath, would rush into the globe and out of the bent pipes in such direction that the reaction produced a rotary motion of the sphere. In 1601 Porta describes an apparatus by which the pressure of steam might be made to raise a column of water. In 1615 De Caus describes a machine which consisted of a metal vessel partly filled with water, in which a pipe was fitted leading nearly to the bottom and open at the top. Fire being applied, the steam forced the water out through the vertical pipe, raising it to a height limited by either the desire of the attendant or the strength of the vessel. In 1629 Branca described, in a work published in Rome, a steam engine in which the steam, issuing from a boiler, impinged upon the vanes of a horizontal wheel.

During the last half of the seventeenth century, the Marquis of Worcester appears to have constructed, in his home at Vauxhall, near London, a device for the raising of water by the aid of steam, and we here come to the first instance in which the force of steam is supposed to have been actually applied to do important and useful work. But Worcester was very unsuccessful in his efforts to introduce the device, and fearful, it seems, that he lose the financial benefits which must follow such introduction, we find no drawings and no minute description of his work.

## HOW MARCONI DOES IT.

From the Land of Macaroni
Came Marconi,
Bill Marconi.
Standing on the ocean's sands;
With a lasso in his hands;
Throws it clear across the sea:
Lands it in the tallest tree,
Where a message has been hung.

Then he pulls it through the skies;
Like a flash of light it flies;
Back upon his sandy shore.
Then he smiles and calls for more,
While the world his praises sing,
And all countries loudly ring
With applause for M. Marconi.
Expert Marconi.

When he's learned his trick right well,
May be can wire to —— Mars.
What a lot of tolls he'd get
From the fellows who want wet,
Fire-proof clothes or pair of wings;
Liquid air and many things.
Such a line would be a cinch,
With the rate a dollar an inch;
Extra charge for call "Hell—o"
For a message down below.
Then the world would surely sing
"Bill Marconi, you're a King."

## WHAT CAUSES BIRD'S EYE MAPLE?

Nobody seems to know what cause it is which produces those delicate and beautiful lines in maple, known as bird's eye. Some people think they come from the hundreds of little branches which shoot out all over the trunk of the tree as soon as a clearing is made around it. Expert timber men say this is not the case. The only way to tell a bird's eye maple tree is to cut it. There are no outward signs by which one can judge. The Railroad Gazette tells a story of the late George M. Pullman. Many years ago he was offered a magohany log for $3,000, to be cut into veneers. It was supposed to be a very fine piece of wood, but this could only be determined by cutting it. He declined the offer, but agreed to take the log cut into veneers for what it was worth. The owner had it sawed and was paid $7,000 for his veneers. Anyone who can discover the secret of determining the interior nature of wood from the outside will have a fortune.

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